

Snow and Ice Storms December 12-13 and 15-16, 2009

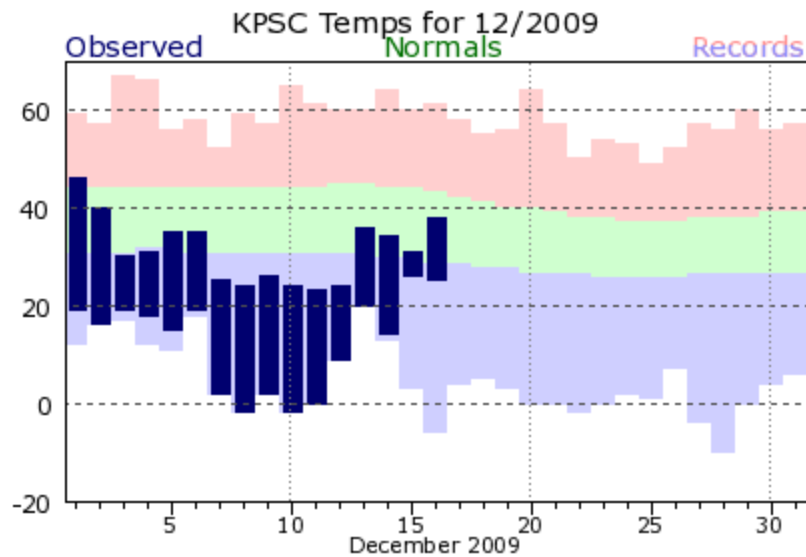
During the first week of December several cold fronts moved south across the Pacific Northwest. A dry air mass with northerly flow aloft created record cold overnight temperatures during this period. Beginning Friday, December 11, 2009 a series of Pacific Weather systems brought warm, moist air across the Pacific Northwest creating several precipitation events. Over the weekend of Friday, December 11 to Sunday December 13, most of the precipitation was in the form of snow. Heavy snow that weekend fell along the foothills of the Blue Mountains and across the northern Blue Mountains. Early the next week, on Monday and Tuesday, the air aloft was warm enough for rain at many lower-elevation locations, especially in central Oregon. However, in the Columbia Basin cold dense air remained trapped and the rain froze once it reached the surface. In the lower Columbia Basin, this freezing rain exceeded depths of 1/4 inch on Tuesday, December 15.

Record Low temperatures were set for at least one location in the Pendleton forecast area each night on Dec. 3 and 4, and from Dec. 6 through Dec. 12. One overnight drop in temperatures occurred December 7 when clear skies allowed efficient cooling overnight. Record cold temperatures set that night are shown in the following table.

...NEW DAILY RECORD LOW TEMPERATURES FOR DECEMBER 7TH...

STATION	PREVIOUS RECORD/YEAR	NEW RECORD	RECORDS BEGAN
*COVE, OR	-1 / 1972	-3	1917
*JOSEPH, OR	0 / 1927	-5	1893
*MADRAS 2N, OR	8 / 1978	8 (TIED)	1952
*MORO, OR	3 / 1972	3 (TIED)	1928
*MITCHELL, OR	20 / 2005	-6	1949
*PENDLETON (CITY), OR	14 / 1928	8	1890
*UNION ES, OR	1 / 1978	1 (TIED)	1928
*GOLDENDALE, WA	10 / 1922	9	1931

The figure below shows the high and low temperatures observed for the Pasco Airport (KPSC) (dark blue bars) for the month of December 2009. The normal low and high temperatures for each day are indicated with green shading. The record lows (lavender shading) and record highs (pink shading) are also shown. Pasco's low temperature was at or near their record from Dec. 6 through Dec. 13. On Dec. 7 the high temperature at the Pasco Airport was 25 deg F. Temperatures did not rise above freezing again at the Pasco Airport until 6 days later, when on the afternoon of Dec. 13 the high temperature was 36 degF. The cold air trapped in the Columbia Basin provided one ingredient for the snow and ice storms that would happen in the coming days.



From Saturday December 12 to Sunday December 13, 2009, heavy snow fell along the foothills of the Blue Mountains and across the northern Blue Mountains. Selected storm totals are summarized in the following report issued by the Pendleton, OR National Weather Service forecast office.

PRELIMINARY LOCAL STORM REPORT...SUMMARY
NATIONAL WEATHER SERVICE PENDLETON OR
1007 PM PST SUN DEC 13 2009

..TIME... ..EVENT... ..CITY LOCATION... ..LAT.LON...
..DATE... ..MAG.... ..COUNTY LOCATION..ST.. ..SOURCE....
..REMARKS..

0400 AM SNOW PENDLETON 45.67N 118.82W
12/13/2009 M3.8 INCH UMATILLA OR OFFICIAL NWS OBS

24-HOUR SNOWFALL 3.8 INCHES AT THE PENDLETON AIRPORT.

0500 AM HEAVY SNOW 6 S TOLLGATE 45.70N 118.11W
12/13/2009 M8.0 INCH UMATILLA OR MESONET

HIGH RIDGE SNOTEL REPORTED 8 INCHES OF NEW SNOW FROM 5 PM
DEC 12TH TO 5 AM DEC 13TH.

0600 AM SNOW 4 NNW MEACHAM 45.56N 118.46W
12/13/2009 M8.8 INCH UMATILLA OR TRAINED SPOTTER

24-HOUR SNOW 8.8 INCHES. CURRENTLY SNOWING.

0600 AM HEAVY SNOW PENDLETON 45.67N 118.82W
12/13/2009 E4.5 INCH UMATILLA OR NWS EMPLOYEE

24-HOUR SNOWFALL 4.5 INCHES.

0645 AM HEAVY SNOW PENDLETON 45.67N 118.82W
12/13/2009 M5.2 INCH UMATILLA OR NWS EMPLOYEE

2 NWS EMPLOYEES LIVING ON SOUTH HILL IN PENDLETON
ESTIMATED AND MEASURED JUST OVER 5 INCHES OF 24 HOUR
ACCUMULATION.

0807 AM HEAVY SNOW 15 E DAYTON 46.31N 117.66W
12/13/2009 E12.0 INCH COLUMBIA WA TRAINED SPOTTER

AN AVERAGE DEPTH OF AROUND 1 FOOT WAS ESTIMATED BY THE
OBSERVER. SOME AREAS AS DEEP AS 2 FEET, DUE TO SNOW
DRIFT. ELEVATION 2180 FEET

0807 AM HEAVY SNOW ATHENA 45.81N 118.49W
12/13/2009 M5.5 INCH UMATILLA OR AMATEUR RADIO

5.5 INCHES OF 24 HOUR ACCUMULATION IN ATHENA, WITH LIGHT
SNOW CURRENTLY.

0900 AM HEAVY SNOW 2 NNW MEACHAM 45.53N 118.44W
12/13/2009 E8.0 INCH UMATILLA OR TRAINED SPOTTER

6 TO 8 INCHES OF SNOW WAS ESTIMATED ON THE GROUND, BUT
SOME DRIFTING HAS OCCURRED. STILL SNOWING. ELEVATION 3800
FEET.

1045 AM HEAVY SNOW 4 E DAYTON 46.32N 117.89W
12/13/2009 M5.0 INCH COLUMBIA WA TRAINED SPOTTER

5 INCHES OF ACCUMULATION OVERNIGHT...LIGHT FLAKES OF SNOW
OCCASIONALLY.

1100 AM HEAVY SNOW 4 N BINGHAM SPRINGS 45.79N 118.22W
12/13/2009 M10.0 INCH UMATILLA OR TRAINED SPOTTER

10 INCHES OF 24 HOUR ACCUMULATION FROM 700 AM TO 7 AM. THE
SNOW HAS BEGUN TO SETTLE AND THE NEW SNOW DEPTH IS
CURRENTLY 8-9 INCHES.

1100 AM HEAVY SNOW 4 ENE DIXIE 46.17N 118.09W
12/13/2009 M5.0 INCH WALLA WALLA WA TRAINED SPOTTER

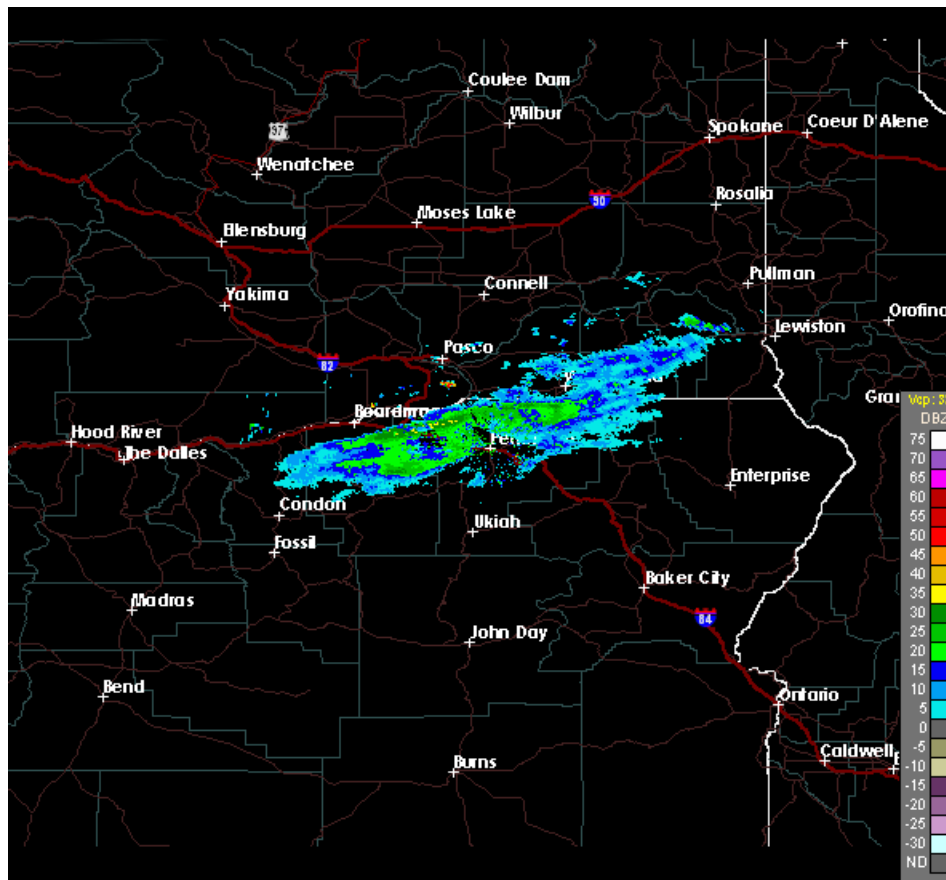
5 INCHES OF ACCUMULATION OVERNIGHT. NO SNOW CURRENTLY

0100 PM SNOW 2 SW MEACHAM 45.49N 118.44W
12/13/2009 M12.0 INCH UMATILLA OR TRAINED SPOTTER

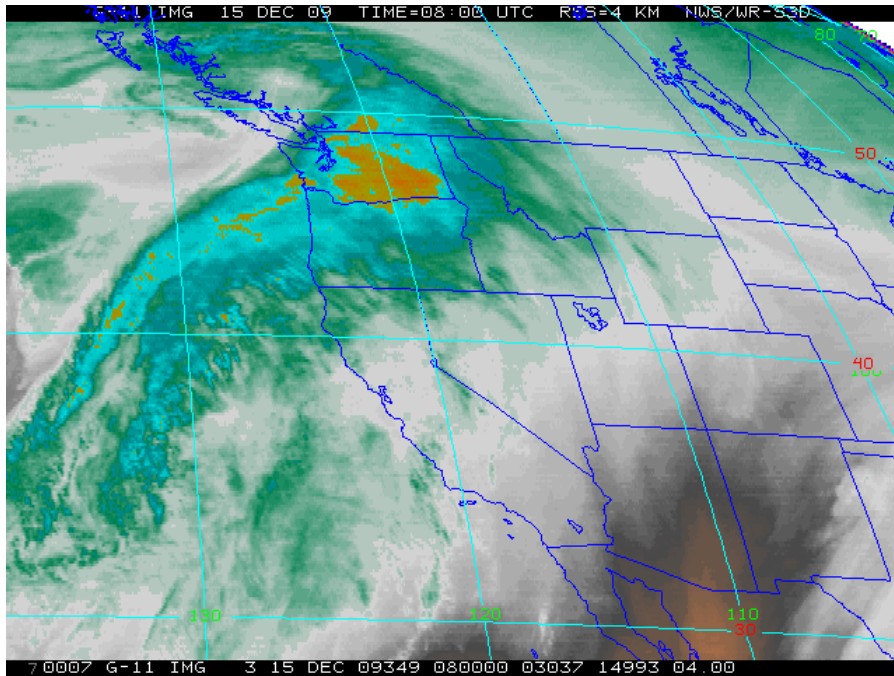
ESTIMATED 24-HOUR SNOW 12 INCHES IN SOME AREAS. MEASURED
12 HOUR ACCUMULATION OF AROUND 8 INCHES FROM 6 PM TO 6
AM. LIQUID EQUIVALENT 0.49 OF AN INCH. MOST OF THE SNOW
ACCUMULATION CAME FROM THE EVENING TO OVERNIGHT PERIOD. 4
INCHES IN THE EVENING AND ANOTHER 4 INCHES OVERNIGHT. UP
TO A FOOT OF ACCUMULATION IN SOME AREAS AROUND THE
RESIDENCE. SNOW HAS ENDED.

Most of the heavy precipitation that fell Saturday morning (Dec. 12) occurred
in east-west snow bands across the southern Columbia Basin. The following
radar image from the NWS Pendleton Doppler radar shows one such band. A
stalled boundary across the southern Columbia Basin between the cold arctic

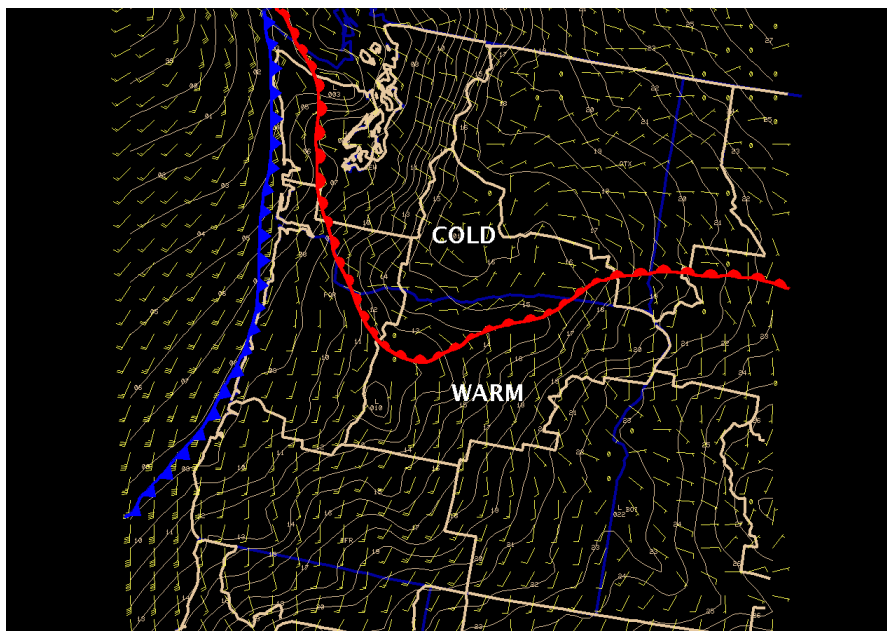
air to the north and warm moist air from the south provided the focus for these snow bands.



The figure below is a satellite image showing water vapor in the atmosphere the afternoon of Monday, December 14. Blue (Orange) shading indicates the high (higher) amounts of water vapor. The image indicates a stream of moisture stretching from Washington state southwestward across the Pacific Ocean. This stream of moisture from over the Pacific Ocean led to heavy precipitation December 14-15, 2009.



Southwest flow aloft and a pair of warm fronts continued to bring warm moist air northeastward across the Pacific Northwest. The map below shows the location of a warm front across the Pacific Northwest around 1 am PST on Dec 15. Warm air from the south moved over cold air trapped in valleys and in portions of the Columbia Basin. This resulted in a mix of wintry precipitation for locations north of the warm front and mainly above 3500 feet south of the front.



Monday night through Tuesday a mix of wintry precipitation fell in the Columbia Basin and surrounding mountains and valleys. Heavy snow fell in the northern Blue Mountains and along the east slopes of the Washington Cascades. Freezing rain accumulated ice over surfaces in the southern Columbia Basin and along the foothills of the Blue Mountains. In the Washington portion of the lower Columbia Basin precipitation Tuesday morning fell as snow but transitioned to freezing rain. The cold air remained deep enough over the Yakima and Kittitas valleys for precipitation to remain in the form of snow. As temperatures warmed Tuesday along the foothills of the Blue Mountains, slopes along higher elevations remained snow and ice covered. Rain running off the frozen slopes caused minor flooding in Athena and Weston, OR.

The following is a summary of storm reports issued by the National Weather Service forecast office in Pendleton, OR.

PRELIMINARY LOCAL STORM REPORT...SUMMARY
NATIONAL WEATHER SERVICE PENDLETON OR
917 AM PST WED DEC 16 2009

..TIME...	..EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...	...MAG....	..COUNTY LOCATION....	...SOURCE....
..REMARKS..			

1217 AM	HEAVY SNOW	8 SE CLIFFDELL	46.85N 120.95W
12/15/2009	M5.0 INCH	YAKIMA	WA TRAINED SPOTTER

5-6 INCHES OF NEW SNOW SO FAR, STILL SNOWING HARD.
TEMPERATURE 23.

0400 AM	HEAVY SNOW	3 W WHITE SWAN	46.39N 120.77W
12/15/2009	M4.0 INCH	YAKIMA	WA TRAINED SPOTTER

4 INCHES OF ACCUMULATION IN 12 HOURS FROM 6 PM TO 4 AM

0600 AM	SNOW	2 SW MEACHAM	45.49N 118.44W
12/15/2009	M7.0 INCH	UMATILLA	OR TRAINED SPOTTER

BETWEEN 6-8 INCHES OF SNOW OVERNIGHT. CURRENTLY...SNOWING
WITH DRIFTING SNOW.

0630 AM	HEAVY SNOW	3 E WEST VALLEY	46.59N 120.54W
12/15/2009	M5.0 INCH	YAKIMA	WA TRAINED SPOTTER

5 INCHES OVERNIGHT

0630 AM	HEAVY SNOW	1 WNW WHITE SALMON	45.74N 121.51W
12/15/2009	E6.0 INCH	KLICKITAT	WA TRAINED SPOTTER

12 HOUR TOTAL.

0630 AM	HEAVY SNOW	5 ENE WEST VALLEY	46.62N 120.51W
12/15/2009	M5.5 INCH	YAKIMA	WA TRAINED SPOTTER

5.5 INCHES OF SNOW OVERNIGHT

0700 AM	SNOW	11 WNW GOLDENDALE	45.90N 121.02W
12/15/2009	E7.0 INCH	KLICKITAT	WA TRAINED SPOTTER

OVERNIGHT TOTAL. CHANGED TO RAIN/FREEZING RAIN

0700 AM HEAVY SNOW 4 WNW WEST VALLEY 46.61N 120.69W
12/15/2009 M6.2 INCH YAKIMA WA TRAINED SPOTTER

RECORDED A 12 HOUR ACCUMULATION OF 6.25 INCHES OF SNOW.

0700 AM HEAVY SNOW YAKIMA 46.59N 120.53W
12/15/2009 M4.2 INCH YAKIMA WA CO-OP OBSERVER

A COCORAHS OBSERVER REPORTED 4.2 INCHES OF 12 HOUR
ACCUMULATION FROM YESTERDAY EVENING TO EARLY THIS
MORNING.

0700 AM HEAVY SNOW 6 W FRUITVALE 46.62N 120.67W
12/15/2009 M6.2 INCH YAKIMA WA CO-OP OBSERVER

6.2 INCHES OF ACCUMULATION WAS REPORTED BY A COCORAHS
OBSERVER.

0900 AM HEAVY SNOW 5 SW SPOUT SPRINGS 45.70N 118.11W
12/15/2009 M11.0 INCH UMATILLA OR MESONET

SNOTEL SIGHT AT HIGH RIDGE RECORDED 11 INCHES OF
ACCUMULATION IN 24 HOURS. ELEVATION 4980.

0900 AM HEAVY SNOW 5 WSW LYLE 45.68N 121.38W
12/15/2009 M4.0 INCH WASCO OR TRAINED SPOTTER

4 INCHES OF SNOW ACCUMULATION WAS MEASURED WITHIN 12
HOURS. CURRENTLY IT IS SLEETING AND THE TEMPERATURE IS 34
DEGREES.

0900 AM HEAVY SNOW 1 W CITY OF THE DALLES 45.60N 121.19W
12/15/2009 E5.5 INCH WASCO OR TRAINED SPOTTER

5-6 INCHES OF SNOW ACCUMULATION WAS MEASURED IN A 12 HOUR
PERIOD. CURRENTLY IT IS RAINING.

0900 AM HEAVY SNOW 1 SSW SNOWDEN 45.82N 121.36W
12/15/2009 M6.0 INCH KLINKITAT WA TRAINED SPOTTER

FROM 6 PM TO 6 AM 6 INCHES OF ACCUMULATION WAS RECORDED.
CURRENTLY IT IS DRIZZLING.

0900 AM HEAVY SNOW 4 NNE CITY OF THE DALLE 45.65N 121.13W
12/15/2009 M4.0 INCH KLINKITAT WA TRAINED SPOTTER

CURRENTLY RAIN AND FREEZING RAIN FALLING. OVERNIGHT WINDS
WERE VERY BREEZY. CURRENTLY THE TEMPERATURE IS 29
DEGREES. THE 12 HOUR SNOW ACCUMULATION OVERNIGHT AND THIS
MORNING WAS 4 INCHES.

1000 AM HEAVY SNOW MEACHAM 45.51N 118.42W
12/15/2009 E10.0 INCH UMATILLA OR DEPT OF HIGHWAYS

ODOT REPORT SINCE 5 AM THIS MORNING.

1014 AM HEAVY SNOW 4 SSW KITTITAS 46.93N 120.45W
12/15/2009 M4.0 INCH KITTITAS WA TRAINED SPOTTER

CURRENTLY CLOUDY AND CALM. 4 INCHES OF SNOW ACCUMULATION

FELL IN A 12 HOUR PERIOD WITH MOST OF THE ACCUMULATION IN THE LATE EVENING.

1014 AM HEAVY SNOW WNW THORP 47.07N 120.67W
12/15/2009 M5.0 INCH KITTITAS WA TRAINED SPOTTER

5 INCHES OF SNOW ACCUMULATED IN 12 HOURS AFTER 7 PM. THE SNOW ENDED AT 5 AM AND IS NOW CLOUDY. THE HIGH TEMPERATURE SO FAR HAS BEEN 29 DEGREES AND THE LOW TEMPERATURE 21 DEGREES.

1030 AM HEAVY SNOW 6 E EASTON 47.25N 121.06W
12/15/2009 M12.0 INCH KITTITAS WA TRAINED SPOTTER

CURRENTLY THE TEMPERATURE IS 27 DEGREES, THE VISIBILITY IS 1 MILE, AND THE SKY IS OVERCAST. THE 12 HOURS SNOW ACCUMULATION WAS 1 FOOT.

1030 AM HEAVY SNOW 7 NNW EASTON 47.32N 121.25W
12/15/2009 M8.0 INCH KITTITAS WA TRAINED SPOTTER

SNOW STARTED A 8 PM LAST NIGHT AND 12 HOURS LATER HAD ACCUMULATED 8 INCHES OF SNOW. CURRENTLY NO PRECIPITATION IS FALLING AND THE TEMPERATURE IS 29 DEGREES

1045 AM HEAVY SNOW 1 NNW GLENWOOD 46.03N 121.30W
12/15/2009 E12.0 INCH KLINKITAT WA TRAINED SPOTTER

24 HOUR TOTAL. STILL SNOWING

1045 AM HEAVY SNOW 1 N TROUT LAKE 46.02N 121.53W
12/15/2009 E12.0 INCH KLINKITAT WA TRAINED SPOTTER

24 HOUR TOTAL STILL SNOWING.

1045 AM SNOW SSE BICKLETON 46.00N 120.30W
12/15/2009 E4.0 INCH KLINKITAT WA TRAINED SPOTTER

CHANGED TO SLEET AND FREEZING RAIN.

0238 PM ICE STORM 1 SW PROSSER 46.20N 119.78W
12/15/2009 BENTON WA TRAINED SPOTTER

FREEZING RAIN PRODUCED A 1/4 INCH OF ICE ACCUMULATION. THE FREEZING RAIN HAS LIGHTENED AND THE TEMPERATURE IS 30.2 DEGREES.

0238 PM ICE STORM 5 SE STANFIELD 45.74N 119.14W
12/15/2009 UMATILLA OR TRAINED SPOTTER

FREEZING RAIN ACCUMULATED AN ESTIMATED 1/4 INCH OF ICE BY THIS AFTERNOON.

0238 PM ICE STORM 1 NE HERMISTON 45.84N 119.28W
12/15/2009 UMATILLA OR TRAINED SPOTTER

RAINING CURRENTLY AND BECAUSE OF THE ICE ALREADY ON THE GROUND THE RAIN IS CONINUING TO FREEZE. THE TEMPERATURE IS 33 DEGREES AND THE ESTIMATED ICE ACCUMULATION IS 1/4 INCH.

0238 PM ICE STORM 5 W RICHLAND 46.28N 119.40W
12/15/2009 BENTON WA TRAINED SPOTTER

FREEZING RAIN ACCUMULATED AND ESTIMATED 1/4 OF ICE
ACCUMULATION INCH BY THIS AFTERNOON.

0944 PM SNOW 8 SE CLIFFDELL 46.85N 120.95W
12/15/2009 M8.0 INCH YAKIMA WA TRAINED SPOTTER

TOTAL SNOW ACCUMULATION 8 INCHES...NW NACHES.

0600 AM HEAVY SNOW 2 SW MEACHAM 45.49N 118.44W
12/16/2009 M14.0 INCH UMATILLA OR TRAINED SPOTTER

24 HOUR TOTAL.

0600 AM HEAVY SNOW 4 N BINGHAM SPRINGS 45.79N 118.22W
12/16/2009 M14.0 INCH UMATILLA OR TRAINED SPOTTER

24 HOUR TOTAL.

In summary, the first week of December 2009 was marked with a cold and dry arctic air mass crossing the Pacific Northwest. By the end of the second week and into the third week of the month, storms brought moisture from the Pacific Ocean creating periods of heavy snow, sleet, rain and freezing rain across northeast Oregon and southeast Washington.